DIAGNOSIS OF SARCOMA.

W. A. BRYAN, A.M., M.D., NASHVILLE, TENN.

In studying sarcomata there are so many difficulties confronting us that a certain amount of despair must come to any one desiring to give the results of accurate scientific work. The cause of malignant tumors is as unknown today as it ever was; the diagnosis is often impossible clinically, and at least at times questionable microscopically, unless in the hands of the most expert; while the results of treatment is most appalling to him who has had most experience in a practical way and had so many disheartening reports of recurrence after every known effort had been conscientiously made at eradication. So true is this that certainly of a given number of sarcomata one must recognize that, so far as present knowledge goes, an irrevocable death sentence has been passed on the majority. Our knowledge of malignant tumors is so meager that even the classification is hazy, overwhelming and delusive as the vast literature on the subject is. Some one has said that it is no wonder we fail to see clearly, since we have raised so much dust in our effort to find cause and treatment.

The phase of the discussion of sarcoma undertaken in this article is the easiest and yet, if we admit our ignorance of the cause and accept our present therapy, it is certainly the most important. The solution of causes must come from the laboratory: meantime the clinician and the surgeon must continue to give the greatest relief to the unfortunate hosts of this dire affliction along the lines experience has marked out.

It is the purpose of this paper first to call attention to the diagnosis of sarcoma by the usual signs and symptoms, and to emphasize the necessity of knowing these symptoms and signs so well that a conclusion is to be reached at the earliest possible moment. Here, contrary to the action of legal courts where there is presumption that the defendant is innocent until proved otherwise, the clinician, in case of the least question, even in case there is a tumor present, should presume that the tumor is not innocent until proved most positively to be, and the most active search for that evidence should be made instantly. Second, to differentiate sarcomata as well as may be done, from simulating benign tumors. Third, to impress that the benign tumor today may at any time in the future assume malignant characteristics and to accept the teaching of the microscope that there are many tumors,which though from present clinical showings, they seem benign, are in reality malignant. Fourth, to show the sites and ages at which sarcomata develop with greatest frequency. Fifth, to show the type of sarcoma that is most likely to affect certain organs, for the value it may have upon prognosis and treatment.

Signs and Symptoms Generally Applicable in the Diagnosis of Sarcoma.—Encapsulation and consequent mobility. That a sarcoma may be encapsulated so completely as to be easily movable is a matter of general teaching, and yet the very fact that such tumor is movable in the structure from which it originates or the tissues surrounding it can be easily glided over it, should never be accepted as a pathognomonic evidence of benignity. Certainly mobility is a differential sign between benign and malignant tumors, and it is so frequently reliable that the very possibility of an exception becomes a danger, capable of causing delay of operation beyond the hope of cure. The fact that a benign tumor may undergo malignant change, or, as some prefer to put it, that a malignant tumor may for a large numbers of years appear benign and suddenly break out into stormy violence is enough to cause the diagnostician to hesitate long to assure his patient that because of its mobility the tumor is and will remain, even probably benign. The pseudo-capsule of incipient sarcoma forms, it is claimed, precisely as in benign tumors, and although certain of the insane or malignant cells are demonstrable in sections made from the capsule and in the surrounding tissues, this transgression of the boundary that marks the limit of benign tumors is as yet inconsequent; the attachment between the intracapsular cells and the infiltrating extracaopsular cells is not established, hence no macroscopical clue can be had that such is the case. The time when sarcomata are still movable is the ideal time for operation, and if a movable tumor cannot be positively classed as benign, I might add, even classified as some one type of benign tumor, then it must be recognized as suspicious, and the microscope invariably called to our aid.

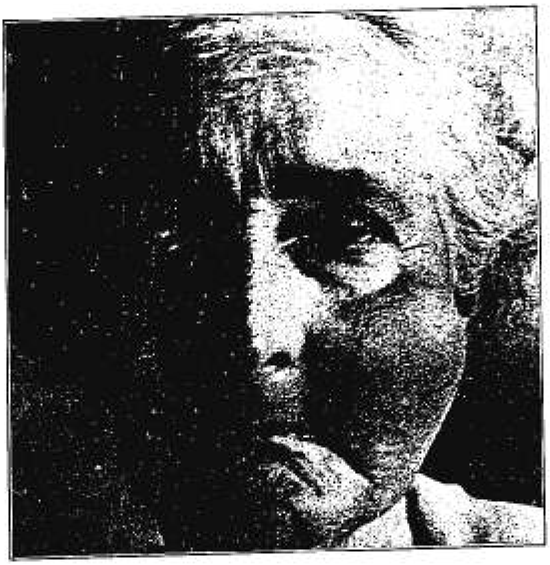


FIGURE 1.—Sarcoma of left superior maxilla in woman 68 years old, removed three months ago. This was one of the cases suffering pain.

Infiltration.—Whether a pseudo-capsule was present or not, sarcoma will attach itself to other structures, and lose, if it had, its mobility. That is to say, that it first becomes immobile in the organ in which it originates, in such a way that both the organ and the tumor may be moved relative to subjacent and superjacent structures, but not relative to each other, yet there is no definite time for such occurrence. I desire to emphasize this simple statement as to what constitutes mobility and to apoligize for thinking it necessary. Later both the organ and the tumor are immovable, the latter attaching the former to adjacent tissues by literally growing into them, obliterating the connective tissue planes or spanning some serous cavity and attaching parietal to visceral coats.

Infiltration is along the lines of least resistance in the first place and in the second is very unlikely to cross certain anatomical lines. As an example of this may be cited the infrequency with which a sarcoma of the diaphysis crosses into or through the epiphyseal line. On the other hand early and extensive invasion of the lumina of veins occurs; and the finger or root-like process extends unhampered along the venous channels ready to be broken off by a slight accident, or without it, and be deposited at a remote point and establish a metastasis. These extensions are capable also of growing along the lumen of veins surrounded by resistant walls and on reaching the surface of developing into distinct nodules. So an intraocular sarcoma may show nodules on the outer surface of the sclerotic at the points of exit of the venæ vorticosæ, and likewise sarcoma of the periosteum attacks the marrow by traveling along the veins communicating between the two through the Haversian canals, or sarcoma of the medulla may likewise attack the periosteum. Such minute fibrils of direct extension are hopeless to naked eye observations, and emphasize beyond the remotest question the fact that in periosteal sarcoma the bone should be removed with the tumor, and *vice versa,* that no subperiosteal excision of sarcoma of bone should ever be attempted.

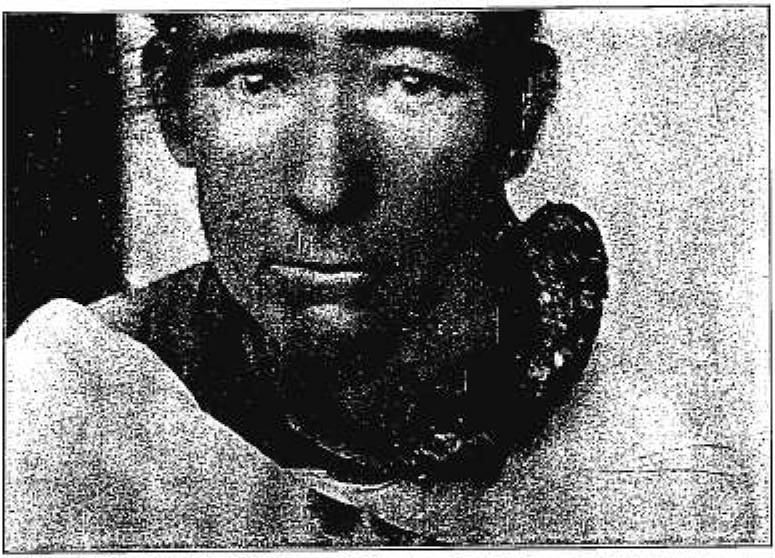


Fig. 2.—Inoperable Sarcoma Neck, resulting from a mole incompletely removed by ligature. This tumor illustrates the effect of incision of malignant growth in the hope of liberating pus. Patient aged 35.

I have stated above that sarcoma tends to follow lines of least resistance. This needs to be modified somewhat inasmuch as it respects very uniformly certain structures whose capacity to resist such invasion would seem to be small; for instance, a sarcoma will grow around a joint and destroy the bone, but not invade the thin, and one would think, helpless synovium. Admitting such exceptions, however, the rule is so widely applicable as to be worth our study. Mediastinal lympho-sarcomata (not so named because of any connection with the lymphatic system, but from a structural resemblance) will gradually surround nerves, bronchi, vessels, pericardium, enter the lung at the root, follow along the structures entering here, compressing and collapsing them until their function is destroyed. It may grow upward along fascial planes, underneath the cervical muscles and expand on reaching the triangles of the neck, not as metastases, but as one tumor mass. Likewise, in sarcomata occurring about the spinal column paraplegia may result from a direct growth of the tumor through the intervertrebral foramina and intra-spinal enlargement which produces pressure on the cord.

Again, in the face, especially the upper jaw, where sarcoma so frequently originates, it will search out the foramina, enter the skull, there expand and give pressure symptoms, leaving such small evidence of continuity as to escape our notice. There is no nook or cranny through which these tumors, hideous alike to the surgeon and the patient, will not enter so easily, so quickly, and with so little trace that the surgeon must not only overlook such extension, but may be compelled, even if suspecting it, to refrain from an attempt at removal. Early recognition, or early action in case of the least suspicion, is all our present knowledge offers in the way of reducing the horrors of a disease behaving so insiduously.

Around nerves sarcoma may so develop as to inhibit or destroy their function. While they will completely surround lymphnodes with no effort to invade them. In melanotic sarcoma, however, the nodes appear filled with melanin, even though they show no sarcoma cells.

When once a sarcoma gains entrance to a muscle sheaths or originates within it the infiltration of tumor cells invades the intrafascicular spaces, isolating muscle fibres from each other so that on physical examination there is apparent a distinct invasion or destruction of the muscle, and on section the appearance is that of complete obliteration of all muscle tissue within the bounds of the tumor, yet under the microscope the muscle fibres are seen to remain.

In general, sarcoma displaces adjacent tissues more than carcinoma does, yet ultimately it will invade every structure that would tend to retard its progress.

Shape, Size and Consistency.—Sarcomata, as a rule, are globular, or fusiform in shape, but as may be inferred from the above, the contour is modified by surrounding resistent structures into any conceivable shape. It may be given as a fairly definite rule that sarcomata growing from soft tissues when covered by non-resisting structures, are more or less globular, as in sub-cutaneous tumors; those originating in muscles, bone and periosteum are fusiform unless the shape of the bone or muscle is irregular or broad and flat respectively, after their growth has been sufficient to bring them under the influence of surrounding barriers. Sarcomata are frequently nodulated much after the fashion of certain uterine fibromata. This may be true of the original tumor, giving the appearance of tumors growing on a tumor, or of several tumors being welded into one; or again a somewhat similar appearance may be produced by the fusion of closely situated secondary tumors with the primary (Cf. Fig. 5).

The size of sarcomata is exceedingly variable, even considered at approximately the same number of months' development. The rule is that they are larger tumors than cancers; any very large malignant tumor, *caeteris paribus*, is more probable the former than the latter.

The larger the tumor at a given time, and the more rapid its growth the more probably is it a small round-celled tumor. The spindle-celled tumors are usually slower and ultimately reach a smaller size than the round-celled group. Yet I have recently removed a sarcamatous uterus weighing 13 pounds, the bulk of whose weight was acquired within the six months prior to operation (See Figs. 3 and 4). Secondary tumors do not, as a rule, reach the size of the primary tumor; yet it is true that the primary growth may remain so obscure that the presence of a malignant tumor may be suspected only when secondary growths become manifest. When metastases are numerous there are large numbers of very small ones, and at times there seems to be a miliary condition, where the little, secondary growths have invaded the whole structure of one or more organs.

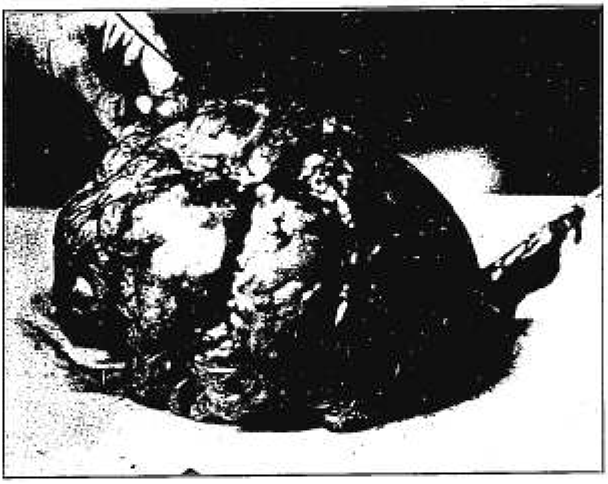


Fig. 3.—Anterior view. Spindle-celled Sarcoma of Uterus; woman, aged 49. This tumor had been recognized ten years ago as a small fibroid and the patient advised that it would disappear at the climacteric. This tumor grew from the size of an orange to 13 pounds in six months.

There is nothing distinctive in the consistency of a sarcoma. When taken, however, in conjunction with the remaining signs and symptoms or when used as a diagnostic difference between this and another tumor, it may be of incalculable value. The more rapid the growth of a sarcoma the softer its consistency; so much so that it is frequently fluctuant or semi-fluctuant, and may lead the unwary into the blunder of incising the tumor in the hope of finding and liberating pus. I have seen no less than three such cases this year, and the uniform result of this procedure can be seen well illustrated in Fig. 2. A digression here may be pardonable: Fluctuation does not mean pus; it means the presence of fluid, or such succulent solids as to behave like fluids. Then all the way from this soft, fluctuant tumor to those of absolutely bony hardness are to be seen. The ordinary spindle-celled sarcoma may be as firm as fibroids, while chondro-sarcoma and osteo-sarcoma, which contain not only malignant cells, but actual deposits of bone or cartilage, resemble those tissues in their resistance. There is this feature of importance in sarcomata, viz., that they, when large, are rarely of uniform hardness. There are to be found soft areas of various sizes, and these when large enough may show distinct fluctuation. These areas are due to degenerative changes or to the escape of blood into the tumor substance. Again, in those benign tumors which have undergone malignant change, the consistency of the tumor may conform largely to that of the original growth, or rapid enlargement and softening may occur throughout. Still the presence of parts of the original tumor unchanged in consistency is no proof that it, too, is not malignant. Angeiosarcoma may be so soft that only the time of appearance, the rapid growth and the constitutional symptoms enable one to distinguish it from angeioma.

Pulsation and even bruit are at times observed in sarcoma. This is especially the case in myelogenous sarcoma. In this type there is a very large blood supply and the distinction from aneurysm must be made most positively.

Surface Appearance.—In only those tumors situated close to or growing toward the skin do we find changes worth noting, if we except those visceral tumors, such as sarcoma of the liver, in which an obstruction of a deep vein forces a compensatory enlargement of superficial veins. The skin over superficial sarcomata becomes at sometime red. It does not show the other local signs of inflammation; this increase of color is simply due to the great vascularity of the tumor. The veins in the skin overlying large sarcomata are practically always enlarged, and the surface may be either smooth or bossellated.

Incidence.—The time of incidence of sarcoma is from the earliest months of life to the ripest old age. I think the profession too prone to believe that the vast majority of tumors occur in people under 30, and that this is a mistake. When the number of people at the age of 70 is compared with the number at the age of 30, it will probably be found that the percentage of sarcomata in the old approximates the percentage of youth much more closely than we have been led to believe. Instead of saying that cancer affects the old and sarcoma the young, beautiful and convenient as this differentiation may seem, it would be far nearer the truth for us to say that sarcoma may come at any age. The average age of twelve sarcomatous patients whom I have seen during the last 12 months was 53 years. The youngest was four years old; the oldest was 73 years. The average is doubtless far higher than a large number of cases would yield, but I am giving it to impress the fact that sarcomata do occur often in people beyond middle life.

Rate of Growth.—The development of sarcomata is more rapid that that of carcinomata, and the average sarcoma is larger than a carcinoma of a corresponding age. When found in the young they grow more rapidly than in adults. In adults even these tumors may grow surprisingly fast, so rapidly indeed as to be mistaken for a phlegmonous lesion. Billroth has reported a sarcoma of the abdominal wall, in which the diagnosis of abscess was at first made. These very acute cases are found much more frequently in the young, and are so devastating in their sweeping growth that the total duration is only a few months. On the other hand, the duration may be very long. Quoting Billroth again, he reports a case of sarcoma of the occipital region which, during twenty years, was operated on fifty times. Others as Pick, Tillaux, and Quenu mention cases which have endured for eighteen or twenty years. A case I operated on five years ago had had a tumor on the soft palate fourteen years, which when excised showed unmistakeable evidence of sarcomatous elements under the microscope. It may be properly claimed that these tumors were benign and have undergone malignant change. This is doubtless true of many of them, yet the lesson to the wise is the same. The average life of sarcomatous patients is from eighteen to thirty months. From the internal structure of sarcomata it is easy to understand that hemorrhage may occur into the substance of the tumor causing a sudden very large increase in the size of it. These hemorrhagic spots may later be replaced by cystic cavities.

Trauma.—Trauma plays a very important part in the history of sarcoma. So valuable a part does it play that any tumor coming up within a few weeks or months succeeding a severe injury, whether it be a fracture or a contusion, should arouse the most active suspicion on the part of the surgeon; and if a positive diagnosis of a benign lesion cannot be made, resort should at once be had to the microscope. Not that every swelling, even if hard and permanent, following an injury, is sarcoma.

A case in point occurred in this city, where a young man received an injury to his thigh and developed a hard mass closely adherent to the bone. A skiagraph was made, which indicated that the tumor was not sarcoma, and this was later confirmed by the microscope, the report being that the growth was bony, apparently myositis ossificans. There were no sarcoma cells. This case illustrates how the last resort should be used and if the finding is against sarcoma no harm results. I would give this note of warning: Absence of history of injury is of no evidence against a diagnosis of sarcoma.

Situation.—The histological distribution of sarcomata is to be remembered. I shall not at this juncture discuss the sites of predilection, but simply refer to the fact that, as sarcoma is of mesoblastic origin, it will be found situated usually at some depth beneath the integument, and that if it arises from the integument, as it does in a small percentage of cases, it will come from its connective tissue. Usually here it is preceded by one of three contributory elements, papilloma, cicatrix, or mole.

Pain.—Pain is too frequently esteemed an essential symptom of sarcoma. That this group

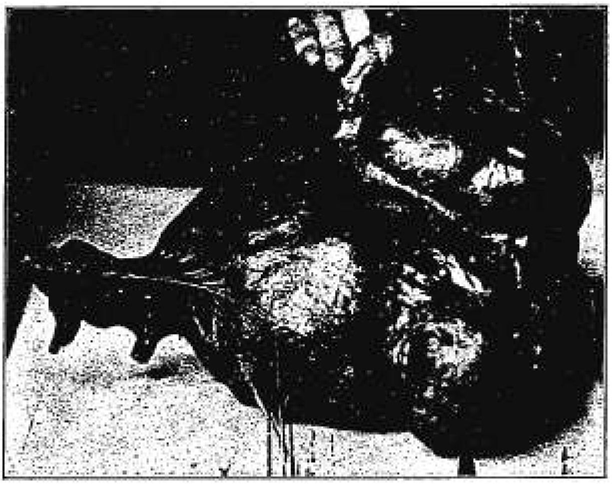


FIG. 4.—Posterior view of Sarcomatous Uterus, same as Fig. 3.

of tumors may be excruciatingly painful is a common observation; that absence of pain has any diagnostic value is a snare and a delusion. Surely pain will come as a routine symptom at some time in the evolution of a sarcoma: but we should cease to look for pain before pronouncing that the tumor is dangerous, and should never hesitate to operate because pain is wanting. Physicians can very wisely educate the people in this direction by assuring and reassuring them that painfulness is not a basis for action in malignant tumors, and that the nature of sarcoma is such that, it may be, when pain forces them to clamor for operation the sole opportunity to offer a chance of cure is lost. The large sarcomatous uterus (Figs. 3 & 4) produced no pain at all, except inconvenience from its weight. In the case of sarcoma of the thigh, illustrated (Fig. 5) pain was not present until the secondary nodules appeared near the origin of the muscle, when it became fairly painful, about three weeks before operation. And it was this far more than the fact that a spreading tumor was in his body that drove this man to the operating table. The sarcoma on the neck (Fig. 2) ulcerated, discharging foul fluids was productive of practically no pain. The truth is that out of the group of cases seen in the past year and used as a foundation for this paper, pain was complained of by only three, and two of these were situated in the superior maxilla.

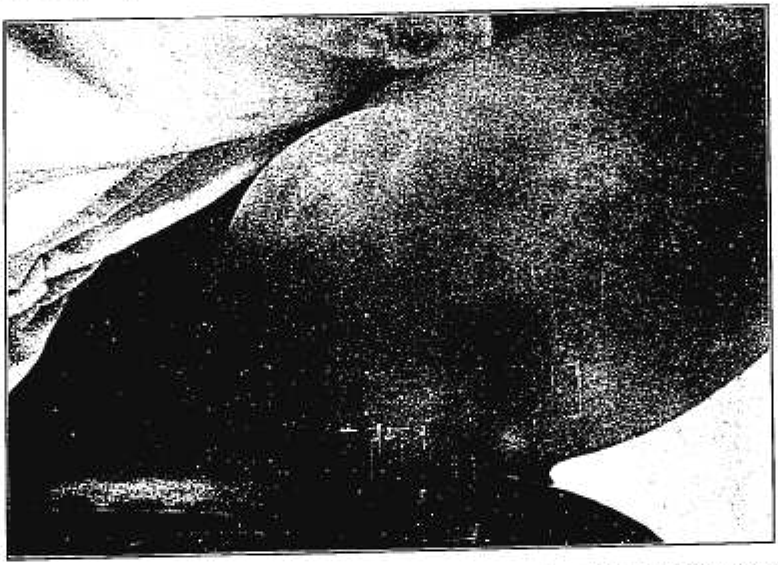


FIG. 5.—Recurrent Sarcoma of thigh in man, aged 56. The large mass was fluctuant and contained a brownish, serous fluid. Note the scar left by a former operation. Just to the right of cross between scrotum and thigh, there are two small painful nodules.

Cachexia.—Cachexia is another deceptive symptom of sarcoma. It does come invariably almost; but it comes late. It is out of proportion to the size and rate of growth of the tumor. Sarcoma patients are, sadly enough, usually in robust health for a considerable time after the onset of the tumor. When hemorrhage, rupture of a cystic cavity, or incision of the tumor under the misconception that it is an abscess has occurred, and there results a raw, bleeding surface or there is a continuous drainage of serum plus more or less pathogenic or saphrogenic infection, cachexia is much more rapid in its development.

Blood.—Examination of the blood gives no valuable findings. There may be present a leucocyte count reaching sometimes as high as 20,000, with a slightly higher than normal percentage of casinophilis and lymphocytes.

Fever.—The temperature may rise and run an irregular course. This seen so frequently in sarcoma of the viscera as to be considered of diagnostic value. It occurs also in acute, rapidly-growing sarcomata and in sarcoma of the bones at times. It usually ranges from 100 to 101 degrees, sometimes reaches 103 degrees, and rarely, as in Vanvert's case of sarcoma of the femur, reaches 104 degrees.

Retrograde Changes. — The degenerative changes seen in sarcomata are often such as to deceive one as to the true condition of things. The most delusive are those that change extensively the consistency of the tumor. The two most important of these may be mentioned as cystic and hemorrhagic. The tumor shown in Fig. 6 shows a large mass below that had been almost completely occupied by a cyst cavity and a serous-looking fluid, while the upper two small nodules were undergoing degeneration in their center and contain each a small amount of colloid. It may be proper to state here that in the primary tumor, removed by another physician some months before there was a cavity filled with a fluid resembling that in the large cavity of this tumor.

Myxomatous degeneration may be found either occupying small areas or they may unite until a large portion of the tumor volume is filled with this substance, while the blood-vessels and a slight connective tissue constitute a frame-work.

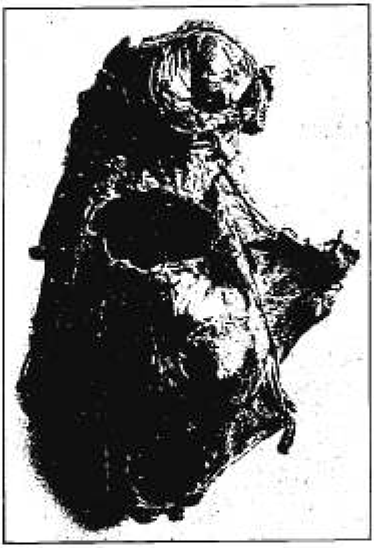


Fig. 6.—Same as Fig. 5, showing the large cyst opened above and below and the two small nodules above. All these tumors are in the adductor longus muscle which was excised, and the fibres of which can be seen in the cut.

Ossification and chondrification of sarcoma may be seen in those tumors arising from osseous or osteogenetic tissue.

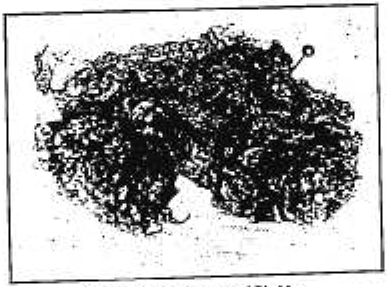
Ulceration, fatty degeneration and caseation are seen. It is doubted if the latter occurs in the absence of tubercle bacilli.

TOTAL EXTIRPATION OF THE URINARY BLADDER.

W. KOHLMANN, M.D., NEW ORLEANS, LA.

Gluck, in 1881, showed the possibility of removing the urinary bladder from dogs. Various surgeons have since performed the operation on the human subject, mainly for malignant disease. The high mortality of the operation and the poor permanent results and rapidity of recurrence have in many instances prevented the performance.

The mortality, according to Wendell, Watson and others, is about sixty per cent. The operated cases recurred very quickly, mostly during the first year. There are a number of cases which have been free from recurrence for a number of years, the cases of Hogge, Pawlick, and Czerny's case of Sarcoma. There is no doubt that the surgical interference has relieved suffering and prolonged life. In all instances, the patient's condition is made more endurable, even if permanent freedom from relapse is secured only in the minority of cases. Kummel considers excision indicated in all malignant tumors of the bladder and according to Mikulicz all patients operated on have been greatly benefited.



Photographic Specimen of Bladder.

Progress in the improvement of illuminating instruments and the more general adoption of cystoscopic examination will enable an earlier diagnosis and earlier radical interference.

The case I wish to report is one which eventually called for more than partial excision and could not get relief without total excision of the organ.

Mrs. A. C., 48 years, widow and mother, March 29, 1908, discharged May 9, 1908.

Family history: Father died at age of 75, mother at 72. Had only one sister who died at age of 54 from heart trouble. No history of neoplasms in family.

Patient was always in good health. Began to menstruate at 13, was always regular and suffered only occasional pains.

Present illness began about fifteen years ago. She had pains and burning in bladder, especially during micturition, and at times difficulty in urinating. Notwithstanding treatment, symptoms continued. Patient consulted me October, 1906. Cystoscopic examination was made and the presence of a papillomatous tumor easily demonstrated.

October, 1906, kolpocystotomy was done

and a papillomatous growth the size of an orange removed which, at the time, did not show any malignant characteristics. Wound was sutured and healed first union. After the operation patient was in good health till fall, 1907, when symptoms returned, only more severe than before. Urine contained pus, blood, and casts. Marked loss of weight.

Patient consulted me again November, 1907, and immediate operation was advised. November 18, suprapubic opening was made and whole bladder lumen was found filled with papillomatous tumors of different size. By means of ligature, clamp and cautery, these tumors were removed. Patient again made good recovery, was able to leave the hospital at the end of six weeks, the suprapubic opening having almost closed. The small opening closed shortly afterwards. There was little relief from this operation. Six weeks afterwards all the distressing symptoms returned and patient entered hospital again to have cystectomy done, the only possibility of giving her relief.

November 30, 1907, operation was performed. In Trendelenburg position a vertical incision three inches in length was made in linea alba, excising at the same time the cicatrix of the suprapubic opening. The incision was carried down to the bladder wall. The bladder was opened and found filled with innumerable papillomatous growths of various size. The cavity was flushed with a warm solution of two per cent. borac. acid and packed with iodoform gauze. By blunt dissection the peritoneum was pushed back without being opened and covered by sterile gauze, the bladder was freed as far down as the base. The urethra was next divided and under continued traction—the bladder being well drawn forward—the ureters were brought into view and easily divided. The right ureter was enlarged and dilated on account of an obstruction, which a mass at the urethral opening had produced. Both ureters were temporarily secured by silk ligatures, to be easily recognized.

It was rather difficult to loosen the bladder from the vagina in the region of the cicatrix following the kolpocystotomy. The vagina was opened in this region. Small slits were made in the vaginal wall and the ureters carried through and kept in position by chromic catgut suture. The cavity in the pelvis was packed with iodoform gauze and a Pezzer Catheter inserted to the depth of the cavity and conducted through the vagina. The abdominal opening was closed with silkworm sutures, a small drain opening being left in the lower end of the incision.

Loss of blood was moderate and, even if there was considerable shock, the patient's life was never in danger. The cavity filled in quickly and the catheter was removed after ten days. Patient made quick recovery and was able to be about in three weeks and left the hospital on May 9th, the abdominal wound having closed and the urine discharging by vagina. She had considerably increased in weight and in general appearance.

To make patient more comfortable and free her from the continued dripping of urine, closure of vaginal opening was decided May 25. The vaginal opening was freed by dissection and closed by deep catgut and superficial silkworm sutures through the perineum. Pezzer Catheter, being easily retained in urethra, drains the urine into a rubber urinal.